A SIMPLE DESING OF A SPECIMEN HOLDER FOR AN ALPHA-SCINTILLATION COUNTER

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Of the various techniques that have been used for the measurement of low level alpha activity, the scintillation counter has proved to be the most versatile, simplest and convenient to use. In the study of the distribution of radioactivity in rocks and minerals one has to face the problem of measurement of counting rates of the order of 1 to 2 alphas per milligram per hour. In order that the measurements of this order of events may be accurate and reliable, it is necessary that the background counts should be minimised to the lowest and the efficiency of the detector should be quite high. These factors depend upon the nature of the photomultiplier used and also on the housing of the counter which has to be such that, under light tight arrangements, it is possible to introduce the sample holder to a fixed position very close below the phosphor, so that the energy loss of the particles due to absorption in air is minimised and the alpha-particles strike the screen under a solid angle of 2π to get the maximum geometric efficiency of 50 percent.

In the existing counters, the sample is generally introduced and kept in position by means of a sliding construction (Owen, *et al*, 1951) or by a spring loaded rotating mechanism (Hollestein *et al*, 1960). In the slide construction, the light tight sealing materials like felt and rubber wear off soon and result in an increased background count due to leakage of light. In the spring loaded rotating mechanism, due to jerks given to the sample holder, it is possible the housing gets contaminated because of the likely spilling of the sample. To avoid these difficulties, a rack and pinion arrangement (9) is used in the present housing.

Figures 1 and 2 give the sectional and isometric views of the counter respectively. The RCA 6199 tube, coated with ZnS(Ag) phosphor directly on the photocathode, is used here. The sample sits in the depression of the sample holder (6), which with its rectangular base slides for a fixed length along the groove of the platform (7), fixed to the top of the rack.

The length of the rack is so chosen that when the pinion is in contact with its lower end, the sample is at a distance less than 1mm from the phosphor screen so that the α-particles strike the screen almost under a 2π solid angle. When the

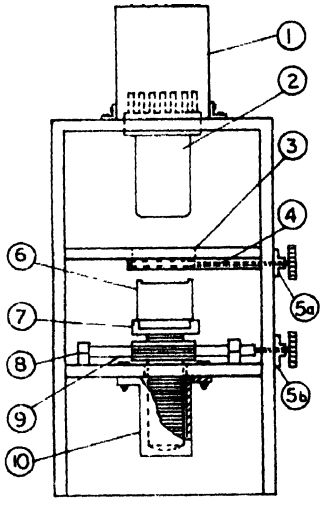

Figure 1.

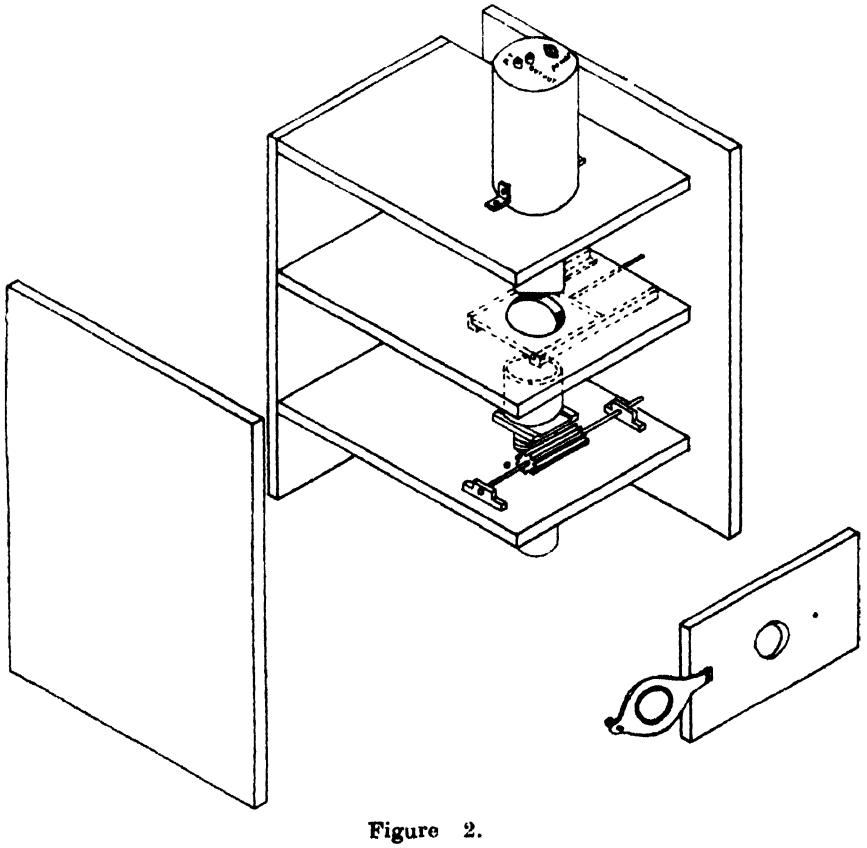

Figure 2.

pinion is in contact with the other end of the rack, the sample holder is in the lowest position. The pinion is supported by two brackets (8) rigidly fixed to the

base, and is operated by the rotation of the knob (5b). To guide the rack for vertical motion during the operation and also to prevent the light from entering through the bottom plate hole, through which the rack moves, a guided bush (10) has been provided for the rack shaft.

The shutter (4) closes the circular opening (3) and thus prevents light from entering into the photo-cathode region. It is made by dove-tail fitting and is operated by a screw rod, through a bush (5a), which is light tight. A multi-start threaded screw is used to quicken the process.

The door shown in the isometric view has '0' ring-lining inside so that when it is closed after introducing the sample and its screw tightened, the '0' ring presses against the wall, and forms a light tight seal.

The time taken for the operation of the counter is quite short. During the operation, the sample holder is brought to the lowest position, the shutter closed, the door opened and the sample taken out. Similarly, after introducing the new sample, the door is closed, shutter opened and the sample taken up by operating the pinion.

The efficiency of the above design is found to be 48 percent and the background is less than 5 counts/hour.

REFERENCES

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Owen, R. B. and Sayle, E. A., 1951, *Proc. Instt. Ele. Engg.*, **98**, II, 245.